

APPENDIX

THE BIOLOGY OF CASMARA KALSHOVENI DIAKONOFF,
AN OECOPHORID BORER

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The borer infestation was detected by the Javanese personnel of my temporary entomological field laboratory at Gedangan (KALSHOVEN, 1955), at a time when particular attention was being paid to the borers in green stems and trunks in the cultivated teak woods of Central Java. The borer larvae were found in the shoots of the small-leaved, wild form of *Murraya paniculata* Jack. (Rutaceae; vernacular name 'djenar', cf. HEYNE, 1950). This is a small tree or shrub up to 6 m high, not uncommon in the area.

After the attack had been discovered through the occurrence of dying and dead shoots, it was observed from November, 1932 to May, 1933. A total of 84 infested shoots and branches, 1—4.5 cm thick, were collected from some 14 trees.

The shoots were bored from immediately below the top or from a lower part downwards over a length of up to 65 cm, mostly in the ligneous parts. Once in a single 2.5 cm thick branch three parallel tunnels in the core were found. In the trunk of another tree, 4.5 cm in diameter, the tunnel ran immediately under the bark. Small black holes from which sap had flown, were visible along the infested parts. According to the collector no frass was seen attached to the branches, the excreta apparently being ejected in loose particles. As a rule the remaining foliage on the branches was still green or withering.

During a visit to the laboratory at the end of October, 1932, I made the following notes. The larvae live in narrow, black-walled, longitudinal tunnels (T. 1 Fig. 2). They are slender, with yellowish thoracic segments, the abdomen is isabel-coloured, the pronotal shield is of a curious shape, the last abdominal segment being flattened and strongly sclerotized. The initial stage of the attack was not observed. The smallest larva collected was 25 mm long, 3 mm broad, the largest 48 mm \times 5 mm.

The clipped shoots were placed in water. Some larvae were moved to a hole in a freshly cut 'djenar' branch. Moving some other larvae to fresh cassava tubers (*Manihot utilissima*, rich in amylose) — method used with some success in raising young larvae of the Cossid *Xyleutes ceramica* (Walk.) — failed altogether in the present case.

Mature larvae pupated readily indoors in the tunnels. Pupae were encountered in the field from the end of November to mid December. Moths emerged between 20 December and 10 May. Notwithstanding considerable mortality, particularly in the larval stage, 19 moths altogether were bred in the laboratory.

Shoot-boring habits have already been recorded in some Oecophoridae in India. T. B. FLETCHER (1917) described the life-history of *Tonica niviferana* Walk., a borer in the shoots of *Bombax malabaricum* DC. (Bombacaceae) and illustrated

it with a nice coloured plate. The borer is not considered to be a real pest, though its activities have stunted young growth in cultivations. The same species was dealt with by BEESON (1941). Judging from the particulars given, its habits differ strongly from those of the *Murraya* borer. In addition to this, BEESON has listed a second Oecophorid borer, viz. *Allotalanta triocellata* (Staint.), which lives in the shoots of *Anthocephalus chinensis* (Lamk.) Rich. ex Walt. [Rubiaceae, = *A. cadamba* (Roxb.) Miq.]. The larvae of five other Indian species, mentioned by BEESON, have different habits, some feeding on leaves spun together, others being case-bearing defoliators.

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